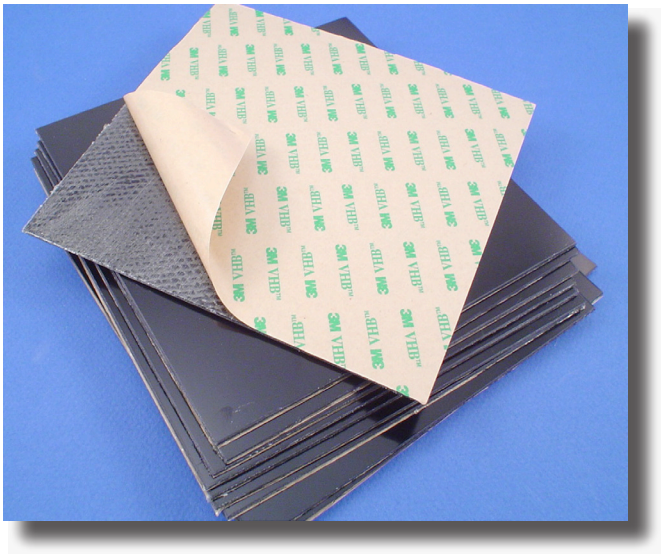
NASA successes

SBIR/STTR Program

Method of Making and Using Shape Memory Polymer Material

Objective

Headquartered in Dayton, Ohio, Cornerstone Research Group (CRG) was founded in April 1997 as a for-profit research and development company. CRG combines creative science and engineering to discover, develop, and deliver materials-based solutions to varied challenges.



Success Highlights

CRG has been awarded 19 NASA Small Business Innovation Research (SBIR) contracts and numerous other contracts from the Air Force, the Navy, and the Missile Defense Agency. Most of CRG's current activities and revenue base are technology developments and implementations that have evolved from the SBIR Program. They have experienced rapid growth and developed a broad base of experience by working on a wide array of programs. Veritex, Rec'Repair, and Rubbn'Repair patches (all based on the initial research under NASA's SBIR Program) are sold directly by CRG's sister company, CRG Industries LLC, a high-tech supplier and manufacturer that became a spin-off company in 2004.

The development of the Shape Memory Polymer (SMP) patch allowed CRG to fully mature the technology into a viable, sellable product in multiple markets from high-performance racing to kayak repair.

Benefits

The patches save significant time and cost in repairing composite materials and other surfaces. Instead of fully replacing a piece of equipment, these SMP patches allow a user to repair the damage quickly and effectively. The patches offer structural support, weather resistance, and secure repair. Unlike tape, the patches remain fixed and will not delaminate during use. They can be used to repair small areas as well as replace entire components.

The Technology

CRG's SMP composite material is trade named Veritex. Veritex is a dynamic composite similar to other high-performance composites, except that CRG's patented Veriflex resin is used as the matrix. Fabrication with Veriflex allows easy manipulation of the composite above the activation temperature and high strength and stiffness at lower temperatures. Veritex capitalizes on its unique resin to quickly soften and harden repeatedly. When heated above its activation temperature, Veritex becomes pliable and can easily be reformed into any shape. When cooled

and restrained in its new shape, Veritex regains its structural stiffness and keeps its new shape. When reheated, Veritex will return to its original shape.

Commercial Applications

SMP composite patches based on Veritex technology are sold under the trade names Rec'Repair (marketed for outdoor equipment repair) and Rubbn'Repair (marketed for racing repair). General Veritex applications include the following:

- Substitution for wet layup for composite parts
- Rapid part manufacturing
- Automotive components
- Dynamic structures and habitats
- Adaptive reinforcement
- Composite repairs

Patents and Licenses

CRG has been awarded several patents related to this technology: Shape Memory Styrene Copolymers, US Pat. No. 6,759,481; Structural and Optical Application for SMP, US Pat. No. 6,986,855; Maleimide-Based High-Temp SMP, US Pat. No. 7,276,195; and Shape Memory Mandrel, US Pat. No. 7,422,714.

To Learn More

More information on the other markets for the patches can be found at *www.rubbnrepair.com* and *www.recrepair.com* or with CRG's sister company CRG Industries at *www.crgindustries.com*.

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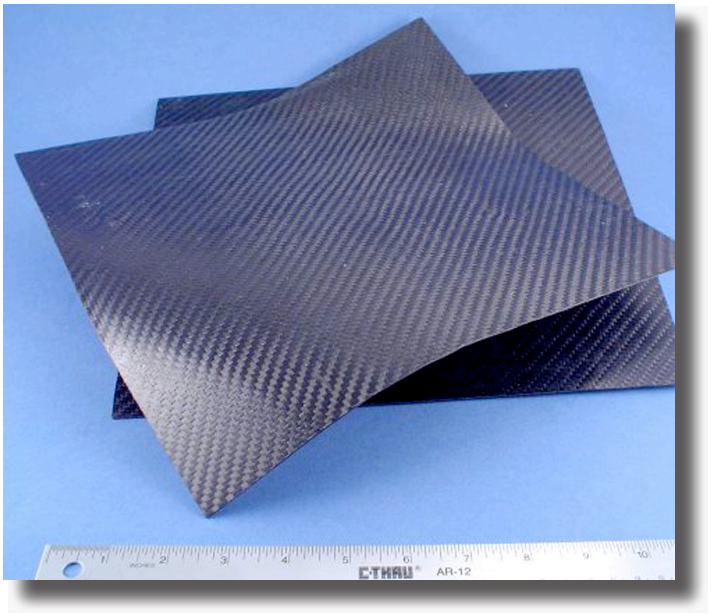

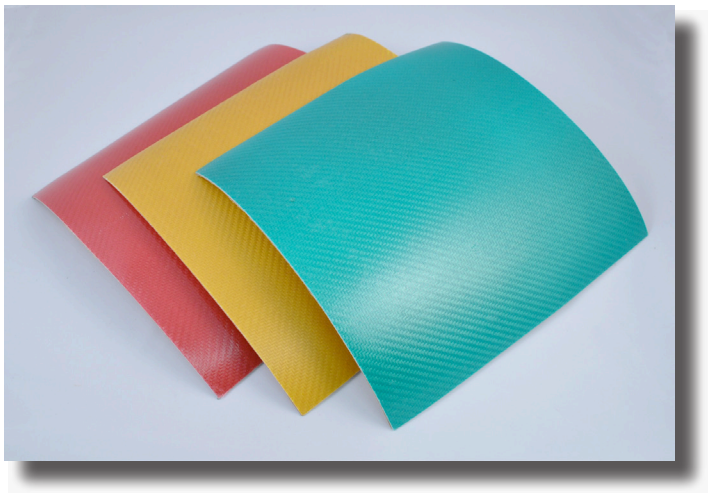

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